

File Inspec 6/29/04

L1 E Crystallisation+all/ct
L2 ferroelectric
L3 123 L1 and L2

L3 ANSWER 73 OF 123 INSPEC (C) 2004 IEE on STN

Full Text

AN 1999:6225935 INSPEC DN A1999-10-6855-114

TI Effect of precursors and stacking structures on crystallization of multi-layered lead zirconate titanate thin films by sol gel method.

AU Suzuki, H.; Kondo, Y.; Kaneko, S. (Dept. of Mater. Sci. & Tech., Shizuoka Univ., Hamamatsu, Japan); Tsutsumi, T.; Miura, T.; Hayashii, T.

SO Chemical Aspects of Electronic Ceramics Processing. Symposium
Editor(s): Kumta, P.N.; Hepp, A.F.; Beach, D.B.; Arkles, B.; Sullivan, J.J.

Warrendale, PA, USA: Mater. Res. Soc, 1998. p.245-50 of xiii+469 pp. 6 refs.

Conference: Boston, MA, USA, 30 Nov-4 Dec 1997

ISBN: 1-55899-400-9

DT Conference Article

TC Experimental

CY United States

LA English

AB Ferroelectric lead zirconate titanate, $\text{Pb}(\text{Zr}_x\text{Ti}_{1-x})\text{O}_3$ (hereafter abbreviated as **PZT**), thin films were prepared by annealing precursor films of multilayered structures composed of alternating layers of **PZT** and lead titanate (hereafter abbreviated as PT). This method (which we refer to as multi-seeding) was used in order to lower the processing temperature of **PZT**. The precursor films were prepared from alkoxide precursor solutions. Effects of zirconium to titanium ratios and stacking structures of the multi-layered precursor films on crystallization behavior were studied to improve the electrical properties of the resultant **PZT** thin films. Layers of PT were inserted between every **PZT** layer in order to seed the crystallization of the desired perovskite phase. PT has previously been shown to crystallize with a pure perovskite structure at temperatures as low as 450 degrees C. Precursor layers of **PZT** with different compositions, ranging from $x=1$ to $x=0.53$ were prepared. In this process, the compositions of the **PZT** precursors and/or the stacking structure, as well as the heating schedule, had a large effect on the crystallization behavior. Nucleation control of the PT seeding layer by changing the heating schedules played an important role in preparing perovskite **PZT** thin films at low temperatures. Dielectric properties of the resultant films depended on the compositions and annealing temperatures. It was demonstrated that the composition of the resultant **PZT** film was controllable in the multi-seeding process, and that dielectric properties of the resultant films were improved.

CC A6855 Thin film growth, structure, and epitaxy; A6140 Structure of amorphous and polymeric materials; A6150C Physics of crystal growth; A7755 Dielectric thin films; A7780 Ferroelectricity and antiferroelectricity; A6170A Annealing processes; A8140G Other heat and thermomechanical treatments; A8115L Deposition from liquid phases (melts and solutions); A6865 Low-dimensional structures: growth, structure and nonelectronic properties; A6460Q Nucleation in phase transitions; A6160 Crystal structure of specific inorganic compounds

CT ANNEALING; CRYSTAL STRUCTURE; CRYSTALLISATION; FERROELECTRIC THIN FILMS; LEAD COMPOUNDS; MULTILAYERS; **NUCLEATION**; SOL-GEL PROCESSING

ST multilayered thin films; sol gel method; crystallization; precursor effects; stacking structure; ferroelectric thin films; $\text{Pb}(\text{Zr}_x\text{Ti}_{1-x})\text{O}_3$; **PZT**; annealing; **PZT/PT alternating layers**; low processing temperature; alkoxide precursor solutions; Zr/Ti ratio; electrical properties; perovskite phase; film composition; heating schedule; nucleation control; dielectric properties; annealing temperature; multi-seeding process; 450 degC; **PZT-PbTiO₃**; $\text{PbZrO}_3\text{TiO}_3$ - PbTiO_3

CHI $\text{PbZrO}_3\text{TiO}_3$ - PbTiO_3 int, $\text{PbZrO}_3\text{TiO}_3$ int, PbTiO_3 int, TiO_3 int, ZrO_3 int, O_3 int, Pb int, Ti int, Zr int, O int, $\text{PbZrO}_3\text{TiO}_3$ ss, PbTiO_3 ss, TiO_3 ss, ZrO_3 ss, O_3 ss, Pb ss, Ti ss, Zr ss, O ss

PHP temperature 7.23E+02 K

ET $\text{O}^*\text{Pb}^*\text{Ti}^*\text{Zr}$; O sy 4; sy 4; Pb sy 4; Ti sy 4; Zr sy 4; $\text{Pb}(\text{Zr}_x\text{Ti}_{1-x})\text{O}_3$; Pb

cp; cp; Zr cp; Ti cp; O cp; C; Zr; O*Pb*Ti; O sy 3; sy 3; Pb sy 3; Ti sy 3; PbTiO3; PbZrO3TiO; PbTiO; O*Ti; TiO; O*Zr; ZrO; O; Pb; Ti

L3 ANSWER 82 OF 123 INSPEC (C) 2004 IEE on STN

Full
Text

References

AN 1998:5873941 INSPEC DN A9809-7755-009

TI Stacking effects on dielectric properties of sol-gel derived Pb(Zr_{0.53}Ti_{0.47})O₃/PbTiO₃ thin films.

AU Ki Hyun Yoon; Ji Hwan Shin; Jeong Hwan Park; Dong Hoon Kang (Dept. of Ceramic Eng., Yonsei Univ., Seoul, South Korea)

SO Journal of Applied Physics (1 April 1998) vol.83, no.7, p.3626-9. 15 refs. Doc. No.: S0021-8979(98)02807-2
Published by: AIP
Price: CCCC 0021-8979/98/83(7)/3626(4)/\$15.00
CODEN: JAPIAU ISSN: 0021-8979
SICI: 0021-8979(19980401)83:7L:3626:SEDP;1-Y

DT Journal

TC Experimental

CY United States

LA English

AB A thin film multilayer structure consisting of Pb(Zr_{0.53}Ti_{0.47})O₃ (**PZT**) and PbTiO₃ (PT) were fabricated by a sol-gel process. The effects of the number of **PZT**/PT layers upon microstructure and dielectric characteristics were investigated. For a pure **PZT** thin layer annealed at 600 degrees C, the microstructure observed was a rosette type, whereas the insertion of PT interlayers yielded thin films with homogeneous grain distribution regardless of the number of **PZT**/PT layers. With increasing number of **PZT**/PT layers, the leakage current density and coercive field effectively decreased, while the dielectric constant increased. Loss tangent and fixed charge were found to be independent of the number of **PZT**/PT layers. These results are possibly explained by the enhanced crystallization resulting from the introduction of large number of nucleation sites in the multilayer film, and by the stacking of stable and dense **PZT**/PT layers. The thin film composed of three **PZT**/PT layers with a thickness of 450 nm exhibited dielectric constant of 1000, remnant polarization of 20 mu C/cm², coercive field of 40 kV/cm, and tan delta of 0.03. The relaxorlike ferroelectric behavior was observed with an increasing number of **PZT**/PT layers.

CC A7755 Dielectric thin films; A7780 Ferroelectricity and antiferroelectricity; A7720 Dielectric permittivity; A7730 Dielectric polarization and depolarization effects; A7740 Dielectric loss and relaxation; A7560E Magnetization curves, hysteresis, Barkhausen and related effects; A6480G Microstructure

CT CERAMICS; COERCIVE FORCE; CRYSTAL MICROSTRUCTURE; CRYSTALLISATION; DIELECTRIC LOSSES; DIELECTRIC POLARISATION; FERROELECTRIC MATERIALS; FERROELECTRIC THIN FILMS; LEAD COMPOUNDS; **NUCLEATION**; PERMITTIVITY; ZIRCONIUM COMPOUNDS

ST stacking effects; dielectric properties; sol-gel derived thin films; multilayer structure; microstructure; rosette type; homogeneous grain distribution; leakage current density; coercive field; dielectric constant; loss tangent; enhanced crystallization; nucleation sites; remnant polarization; relaxorlike ferroelectric behavior; 600 C; Pb(Zr_{0.53}Ti_{0.47})O₃-PbTiO₃

CHI PbZr_{0.53}Ti_{0.47}O₃-PbTiO₃ int, PbZr_{0.53}Ti_{0.47}O₃ int, PbTiO₃ int, Ti_{0.47} int, Zr_{0.53} int, TiO₃ int, O₃ int, Pb int, Ti int, Zr int, O int, PbZr_{0.53}Ti_{0.47}O₃ ss, PbTiO₃ ss, Ti_{0.47} ss, Zr_{0.53} ss, TiO₃ ss, O₃ ss, Pb ss, Ti ss, Zr ss, O ss

PHP temperature 8.73E+02 K

ET O*Pb*Ti*Zr; O sy 4; sy 4; Pb sy 4; Ti sy 4; Zr sy 4; Pb(Zr_{0.53}Ti_{0.47})O₃; Pb cp; cp; Zr cp; Ti cp; O cp; O*Pb*Ti; O sy 3; sy 3; Pb sy 3; Ti sy 3; PbTiO₃; C; Pb(Zr_{0.53}Ti_{0.47})O₃-PbTiO₃; PbZr_{0.53}Ti_{0.47}O; PbTiO; Ti; Zr; O*Ti; TiO; O; Pb

L3 ANSWER 83 OF 123 INSPEC (C) 2004 IEE on STN

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| Full Text | Single References |
|--------------|----------------------|

AN 1998:5853330 INSPEC DN A9808-8115L-008; B9804-0520-018
 TI Seeding studies in **PZT** thin films.
 AU Wu, A.; Vilarinho, P.M.; Salvado, I.M.M.; Baptista, J.L. (Dept. of Ceramic & Glass Eng., Aveiro Univ., Portugal)
 SO Materials Research Bulletin (Jan. 1998) vol.33, no.1, p.59-68. 10 refs.
 Doc. No.: S0025-5408(97)00189-X
 Published by: Elsevier
 Price: CCCC 0025-5408/98/\$19.00+.00
 CODEN: MRBUAC ISSN: 0025-5408
 SICI: 0025-5408(199801)33:1L.59:SSTF;1-5
 DT Journal
 TC Experimental
 CY United States
 LA English
 AB Lead zirconate titanate (**PZT**) solid solutions exhibit excellent ferroelectric, piezoelectric, pyroelectric, and electrooptical properties and, therefore, are very attractive for the electronic industry. Low-temperature thermal treatment of the films enhances the incorporation of sol-gel derived **PZT** thin films into integrated circuits. The nucleation temperature of the perovskite phase and the temperature to get a pure perovskite phase can be lowered using heterogeneous nucleation. In this work, thin films of **PZT** with a zirconium to titanium ratio of 52/48 have been prepared by the sol-gel method using metal alkoxides. Different types of crystalline seeds were used, and their effects on the perovskite phase crystallization were compared. The crystallographic and morphological properties of the films have been analyzed by X-ray diffraction and scanning electron microscopy.
 CC A8115L Deposition from liquid phases (melts and solutions); A7780 Ferroelectricity and antiferroelectricity; A7755 Dielectric thin films; B0520 Thin film growth; B2810F Piezoelectric and ferroelectric materials
 CT FERROELECTRIC MATERIALS; FERROELECTRIC THIN FILMS; LEAD COMPOUNDS; **NUCLEATION**; SOL-GEL PROCESSING; X-RAY DIFFRACTION
 ST **PZT thin films**; ferroelectric; piezoelectric; pyroelectric; electrooptical properties; sol-gel derived; nucleation temperature; perovskite phase; morphological properties; X-ray diffraction; scanning electron microscopy; **PZT**; PbZrO₃TiO₃
 CHI PbZrO₃TiO₃ ss, TiO₃ ss, ZrO₃ ss, O₃ ss, Pb ss, Ti ss, Zr ss, O ss
 ET O*Pb*Ti*Zr; O sy 4; sy 4; Pb sy 4; Ti sy 4; Zr sy 4; PbZrO₃TiO₃; Pb cp; cp; Zr cp; O cp; Ti cp; O*Ti; TiO; O*Zr; ZrO; O; Pb; Ti; Zr

L3 ANSWER 87 OF 123 INSPEC (C) 2004 IEE on STN

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|--------------|----------------------|
| Full Text | Single References |
|--------------|----------------------|

AN 1997:5741723 INSPEC DN A9724-8115L-004; B9712-0520-015
 TI Low-temperature processing of highly oriented Pb(ZrxTil-x)O₃ thin film with multi-seeding layers.
 AU Suzuki, H.; Kaneko, S. (Dept. of Mater. Sci. & Technol., Shizuoka Univ., Hamamatsu, Japan); Murakami, K.; Hayashi, T.
 SO Japanese Journal of Applied Physics, Part 1 (Regular Papers, Short Notes & Review Papers) (Sept. 1997) vol.36, no.9B, p.5803-7. 12 refs.
 Published by: Publication Office, Japanese Journal Appl. Phys
 CODEN: JAPNDE ISSN: 0021-4922
 SICI: 0021-4922(199709)36:9BL.5803:TPHO;1-2
 Conference: Ferroelectric Materials and their Applications. 14th Meeting. Kyoto, Japan, 28-31 May 1997
 DT Conference Article; Journal
 TC Experimental
 CY Japan
 LA English
 AB An improved sol-gel process using molecular-designed alkoxide precursor was described for a lead zirconate titanate (**PZT**) thin film. This method

involves the insertion of inter-layer films of a perovskite lead titanate (PT) layer as a transient seeding layer between each **PZT** layers, which offers nucleation sites to reduce the activation energy for the crystallization, leading to the low processing temperature (hereafter, abbreviated as a multi-seeding process). An intermediate pyrochlore phase developed in the film by annealing at around 400 degrees C in an air, and then was completely converted to a perovskite phase at a low temperature of 450 degrees C. The relative permittivity of the resulting film annealed at 450 degrees C increased with increasing film thickness and reached about 350 at 1.9 μm . In addition, highly oriented **PZT** film was obtained by annealing at 500 degrees C for 2 hours in an air. This highly oriented film exhibited high relative permittivity of about 500 due to its microstructure. As a result, it was demonstrated that multi-seeding process was desirable for obtaining a single phase perovskite **PZT** film at low temperatures.

CC A8115L Deposition from liquid phases (melts and solutions); A7780 Ferroelectricity and antiferroelectricity; A7755 Dielectric thin films; A7760 Piezoelectricity and electrostriction; A8120L Preparation of ceramics and refractories; A6855 Thin film growth, structure, and epitaxy; A7720 Dielectric permittivity; A8140G Other heat and thermomechanical treatments; A8140R Electrical and magnetic properties (related to treatment conditions); A6480G Microstructure; B0520 Thin film growth; B2810F Piezoelectric and ferroelectric materials; B0540 Ceramics and refractories (engineering materials science)

CT ANNEALING; CRYSTAL MICROSTRUCTURE; CRYSTALLISATION; FERROELECTRIC MATERIALS; FERROELECTRIC THIN FILMS; LEAD COMPOUNDS; **NUCLEATION**; PERMITTIVITY; PHASE EQUILIBRIUM; PIEZOCERAMICS; SOL-GEL PROCESSING

ST low-temperature processing; highly oriented $\text{Pb}(\text{Zr}_x\text{Ti}_{1-x})\text{O}_3$ thin film; multi-seeding layers; sol-gel process; molecular-designed alkoxide precursor; lead zirconate titanate; inter-layer films; perovskite lead titanate; transient seeding layer; nucleation sites; activation energy; crystallization; low processing temperature; multi-seeding process; intermediate pyrochlore phase; annealing; relative permittivity; film thickness; **highly oriented PZT film**; microstructure; **single phase perovskite PZT film**; low temperatures; 400 to 500 C; 1.9 μm ; **PZT**; $\text{PbZrO}_3\text{TiO}_3$

CHI $\text{PbZrO}_3\text{TiO}_3$ ss, TiO_3 ss, ZrO_3 ss, O3 ss, Pb ss, Ti ss, Zr ss, O ss

PHP temperature 6.73E+02 to 7.73E+02 K; size 1.9E-06 m

ET O*Pb*Ti*Zr; O sy 4; sy 4; Pb sy 4; Ti sy 4; Zr sy 4; $\text{Pb}(\text{Zr}_x\text{Ti}_{1-x})\text{O}_3$; Pb cp; cp; Zr cp; Ti cp; O cp; C; PbZrO_3TiO ; O*Ti; TiO ; O*Zr; ZrO ; O; Pb; Ti; Zr

=> \approx his

(FILE 'HOME' ENTERED AT 14:38:01 ON 29 JUN 2004)

FILE 'INSPEC' ENTERED AT 14:39:11 ON 29 JUN 2004

E CRYSTALLISATION+ALL/CT

L1 30811 E6 OR E12
L2 9629 PZT OR FERREROELECTRIC
L3 123 L1 AND L2

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| L Number | Hits | Search Text | DB | Time stamp |
|----------|---------|--|--------------------|---------------------|
| 1 | 346 | "Al-Shareef" Bellur Auciello Kingon | USPAT; US-PGPUB | 2004/06/29 14:06 |
| 2 | 24360 | ferroelectric or pzt | USPAT; US-PGPUB | 2004/06/29 14:03 |
| 3 | 211 | ("Al-Shareef" Bellur Auciello Kingon) and (ferroelectric or pzt) | USPAT; US-PGPUB | 2004/06/29 14:03 |
| 4 | 1240005 | @ad>19981123 @rlad>19981123 | USPAT; US-PGPUB | 2004/06/29 14:04 |
| 5 | 88 | ((("Al-Shareef" Bellur Auciello Kingon) and (ferroelectric or pzt)) not (@ad>19981123 @rlad>19981123) | USPAT; US-PGPUB | 2004/06/29 14:04 |
| 6 | 79 | ("Al-Shareef" Bellur Auciello Kingon).in. | USPAT; US-PGPUB | 2004/06/29 14:12 |
| 7 | 29 | (ferroelectric or pzt) and (("Al-Shareef" Bellur Auciello Kingon).in.) | USPAT; US-PGPUB | 2004/06/29 14:13 |
| 8 | 11 | ((ferroelectric or pzt) and (("Al-Shareef" Bellur Auciello Kingon).in.)) not (@ad>19981123 @rlad>19981123) | USPAT; US-PGPUB | 2004/06/29 14:13 |
| - | 65379 | 438/3,240,396.ccls. | USPAT; US-PGPUB | 2004/06/29 14:02 |
| - | 0 | semiconductor or ic or "integrated circuit" or microelectronic | USPAT; US-PGPUB | 2003/05/29 17:11 |
| - | 2234 | ferroelectric with layers | USPAT; US-PGPUB | 2004/06/28 14:01 |
| - | 0 | 438/3,240,396.ccls | USPAT; US-PGPUB | 2004/06/28 14:01 |
| - | 3506 | 438/3,240,396.ccls. | USPAT; US-PGPUB | 2004/06/28 14:02 |
| - | 394 | (ferroelectric with layers) and 438/3,240,396.ccls. | USPAT; US-PGPUB | 2004/06/28 14:03 |
| - | 1 | ("6229166").PN. | USPAT; US-PGPUB | 2004/06/28 14:04 |
| - | 116 | ((ferroelectric with layers) and 438/3,240,396.ccls.) not (@ad>19981123 @rlad>19981123) | USPAT; US-PGPUB | 2004/06/28 14:55 |
| - | 99339 | seed | USPAT; US-PGPUB | 2004/06/28 14:05 |
| - | 4 | ((((ferroelectric with layers) and 438/3,240,396.ccls.) not (@ad>19981123 @rlad>19981123)) and seed | USPAT; US-PGPUB | 2004/06/28 14:05 |
| - | 34 | ("0476274" "2490547" "2622184" "2801322" "2925329" "3190262" "3404873" "3520416" "3549412" "3659402" "3823926" "3969449" "4036915" "4080926" "4288396" "4529427" "4833976" "4842893" "4847469" "4954371" "5034372" "5097800" "5110622" "5120703" "5139999" "5165960" "5204314" "5225561" "5248787" "5259995" "5280012" "5376409" "5536323" "5554866").PN. | USPAT | 2004/06/28 14:20 |
| - | 112 | ((((ferroelectric with layers) and 438/3,240,396.ccls.) not (@ad>19981123 @rlad>19981123)) not (((ferroelectric with layers) and 438/3,240,396.ccls.) not (@ad>19981123 @rlad>19981123)) and seed) | USPAT; US-PGPUB | 2004/06/28 18:54 |
| - | 1 | ("5155658").PN. | USPAT; US-PGPUB | 2004/06/28 16:33 |
| - | 11390 | pzt | USPAT; US-PGPUB | 2004/06/28 18:54 |

| | | | | |
|---|--------|--|--------------------|---------------------|
| - | 3232 | tio or pbtio | USPAT; US-PGPUB | 2004/06/28 18:54 |
| - | 23 | pzt with (tio or pbtio) | USPAT; US-PGPUB | 2004/06/28 18:54 |
| - | 5 | (pzt with (tio or pbtio)) not (@ad>19981123 @rlad>19981123) | USPAT; US-PGPUB | 2004/06/28 18:55 |
| - | 62 | pzt with combinations | USPAT; US-PGPUB | 2004/06/28 18:56 |
| - | 15 | (pzt with combinations) not (@ad>19981123 @rlad>19981123) | USPAT; US-PGPUB | 2004/06/28 19:01 |
| - | 204599 | crystallization or nucleation or seed | USPAT; US-PGPUB | 2004/06/28 19:01 |
| - | 11390 | pzt | USPAT; US-PGPUB | 2004/06/28 19:01 |
| - | 184 | (tio or pbtio) and pzt | USPAT; US-PGPUB | 2004/06/28 19:01 |
| - | 56 | ((tio or pbtio) and pzt) not (@ad>19981123 @rlad>19981123) | USPAT; US-PGPUB | 2004/06/28 19:01 |

(FILE 'HOME' ENTERED AT 13:48:26 ON 29 JUN 2004)

FILE 'INSPEC' ENTERED AT 13:48:35 ON 29 JUN 2004

E CRYSTALLIZATION+ALL/CT

L1 30612 E2
E NUCLEATION+ALL/CT
L2 7810 E4
L3 54122 FERROELECTRIC OR PZT
L4 51070 SEED OR NUCLEATION
L5 736 NUCLEATES
L6 51393 L4 OR L5
L7 37842 L1 OR L2
L8 127 L7 AND L3 AND L6
L9 46168 (TOP AND BOTTOM) OR (UPPER AND LOWER)
L10 3 L8 AND L9

=> 1-3 all

L10 ANSWER 1 OF 3 INSPEC (C) 2004 IEE on STN

| | |
|--------------|----------------|
| Full Text | Single Page |
|--------------|----------------|

AN 2003:7502379 INSPEC DN A2003-04-7755-006; B2003-02-2130-013
 TI Iridium based electrodes for **ferroelectric** capacitor fabrication.
 AU Johnson, J.A.; Lisoni, J.G.; Wouters, D.J. (IMEC, Leuven, Belgium)
 SO Ferroelectric Thin Films X (Materials Research Society Symposium
 Proceedings Vol.695)
 Editor(s): Gilbert, S.R.; Trolrier-McKinstry, S.; Miyasaka, Y.; Streiffer,
 S.K.; Wouters, D.J.
 Warrendale, PA, USA: Mater. Res. Soc, 2002. p.59-64 of xv+424 pp. 5 refs.
 Conference: Boston, MA, USA, 25-29 Nov 2001
 DT Conference Article
 TC Experimental; Practical
 CY United States
 LA English
 AB Ir and its conductive oxide, IrO₂, are candidates to replace Pt as the
 electrodes in **ferroelectric** capacitors (FECAPs) because of improved
 endurance (since e.g. Pt/PZT/Pt shows strong fatigue) and also because
 of the oxygen barrier properties of Ir/IrO₂ stacks that enable the
 fabrication of stacked FECAPs on **top** of contact plugs. Two important
 issues related to these electrodes are the control of the **ferroelectric**
 layer orientation on **top** of these materials, as well as material
 stability (e.g. oxidation and possible growth of large IrO₂ crystallites).
 In this work, we show that IrO₂ **bottom** electrodes affect the
 crystallization of sol-gel deposited Pb(Zr,Ti)O₃ (**PZT**). While **PZT**
 films deposited on (111) Pt show a (111) preferential orientation, IrO₂
 electrodes nucleate strongly different oriented **PZT**. Controlling and
 changing the microstructure of the **bottom** electrode allows tuning of
 these **PZT** orientations and the resulting grain morphology, and,
 consequently, their FECAP polarization hysteresis properties.
 CC A7755 Dielectric thin films; A6480G Microstructure; A6470K Solid-solid
 transitions; A8115L Deposition from liquid phases (melts and solutions);
 A7730 Dielectric polarization and depolarization effects; A7780D
 Ferroelectric domain structure and effects; hysteresis; B2130 Capacitors;
 B2860F Ferroelectric devices; B0520J Deposition from liquid phases; B2810F
 Piezoelectric and ferroelectric materials
 CT CRYSTAL ORIENTATION; **CRYSTALLISATION**; CRYSTALLITES; DIELECTRIC
 HYSTERESIS; DIELECTRIC POLARISATION; **FERROELECTRIC** CAPACITORS;
FERROELECTRIC THIN FILMS; GRAIN SIZE; IRIIDIUM COMPOUNDS; LEAD COMPOUNDS;
NUCLEATION; SOL-GEL PROCESSING
 ST iridium based electrodes; **ferroelectric capacitors**; FECAPs; conductive
 oxide; **IrO₂ bottom electrodes**; oxygen barrier properties; Ir/IrO₂
 stacks; contact plugs; **ferroelectric layer orientation**; material
 stability; oxidation; IrO₂ crystallites growth; crystallization; sol-gel
 deposited Pb(Zr,Ti)O₃; **PZT**; **nucleation**; microstructure; **PZT**

orientations; grain morphology; polarization; hysteresis properties;

IrO2-PZT; IrO2-PbZrO3TiO3

CHI IrO2-PbZrO3TiO3 int, PbZrO3TiO3 int, IrO2 int, TiO3 int, ZrO3 int, Ir int, O2 int, O3 int, Pb int, Ti int, Zr int, O int, PbZrO3TiO3 ss, TiO3 ss, ZrO3 ss, O3 ss, Pb ss, Ti ss, Zr ss, O ss, IrO2 bin, Ir bin, O2 bin, O bin
ET Ir; Ir*O; IrO2; Ir cp; cp; O cp; Pt; Pb*Zr; Pb sy 2; sy 2; Zr sy 2; Pb(Zr; Pb cp; Zr cp; Ti; IrO; O*Pb*Ti*Zr; O sy 4; sy 4; Pb sy 4; Ti sy 4; Zr sy 4; PbZrO3TiO; Ti cp; O*Ti; TiO; O*Zr; ZrO; O; Pb; Zr

L10 ANSWER 2 OF 3 INSPEC (C) 2004 IEE on STN

Full
Text

AN 2002:7238960 INSPEC DN B2002-05-2860F-003

TI Low temperature epitaxial growth of **PZT** on conductive perovskite LaNiO3 electrode for embedded capacitor-over-interconnect (COI) FeRAM application.

AU Lung, S.L. (Macronix Int. Co., Hsinchu, Taiwan); Liu, C.L.; Chen, S.S.; Lai, S.C.; Tsai, C.W.; Sheng, T.T.; Tahui Wang; Pan, S.; Wu, T.B.; Liu, R.

SO International Electron Devices Meeting. Technical Digest (Cat. No.01CH37224)

Piscataway, NJ, USA: IEEE, 2001. p.12.4.1-4 of 951 pp. 4 refs. Also available on CD-ROM in PDF format

Conference: Washington, DC, USA, 2-5 Dec 2001

Sponsor(s): Electron Devices Soc. IEEE

Price: CCCC 0-7803-7050-3/01/\$10.00

ISBN: 0-7803-7050-3

DT Conference Article

TC Application; Experimental

CY United States

LA English

AB By using a conductive perovskite LaNiO3 (LNO) **bottom** electrode as **seed** layer, the crystallization temperature of in-situ sputter deposited **PZT** has been greatly reduced from 600 degrees C to 350 degrees C 400 degrees C. LNO's near-perfect lattice match with **PZT** allows **PZT** to growth epitaxially at low temperature. The 2Pr value of the low temperature grown **PZT** is about 20 mu C/cm², and this provides 130mV-400mV sense margin when bit line capacitance is 800fF. When Pt is used as the **top** electrode, an amorphous layer, which degrades the electric fatigue performance, is found at the interface of Pt and **PZT**. When the **top** electrode is replaced by LNO, the thickness of the amorphous layer is decreased, and fatigue is improved. COI FeRAM structure can be easily achieved by this low temperature capacitor process, and is suitable for advanced Cu/low-K embedded logic application.

CC B2860F Ferroelectric devices; B0520B Sputter deposition; B1265D Memory circuits; B2130 Capacitors

CT **CRYSTALLISATION; EPITAXIAL LAYERS; FERROELECTRIC CAPACITORS; FERROELECTRIC STORAGE; FERROELECTRIC THIN FILMS; LANTHANUM COMPOUNDS; LEAD COMPOUNDS; RANDOM-ACCESS STORAGE; SPUTTERED COATINGS**

ST low temperature epitaxial growth; **PZT thin film**; embedded capacitor-over-interconnect FeRAM; conductive perovskite LaNiO3 electrode; electrical fatigue; Pt electrode; amorphous layer; **seed layer**; crystallization; sputter deposition; lattice matching; 350 to 400 C; 800 fF; **PZT-LaNiO3**; PbZrO3TiO3-LaNiO3

CHI PbZrO3TiO3-LaNiO3 int, PbZrO3TiO3 int, LaNiO3 int, TiO3 int, ZrO3 int, La int, Ni int, O3 int, Pb int, Ti int, Zr int, O int, PbZrO3TiO3 ss, LaNiO3 ss, TiO3 ss, ZrO3 ss, La ss, Ni ss, O3 ss, Pb ss, Ti ss, Zr ss, O ss

PHP temperature 6.23E+02 to 6.73E+02 K; capacitance 8.0E-13 F

ET La*Ni*O; La sy 3; sy 3; Ni sy 3; O sy 3; LaNiO3; La cp; cp; Ni cp; O cp; C; Pr; F; Pt; Cu; K; O*Pb*Ti*Zr; O sy 4; sy 4; Pb sy 4; Ti sy 4; Zr sy 4; PbZrO3TiO; Pb cp; Zr cp; Ti cp; LaNiO; O*Ti; TiO; O*Zr; ZrO; La; Ni; O; Pb; Ti; Zr

L10 ANSWER 3 OF 3 INSPEC (C) 2004 FIZ KARLSRUHE on STN

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AN 1995:4896358 INSPEC DN A9507-7755-001

TI Phase annealing effects on the electrical properties of Pb(Zr_{0.53}Ti_{0.47})O₃ thin films with RuO₂ electrodes.

AU Al-Shareef, H.N.; Bellur, K.R.; Auciello, O.; Kingon, A.I. (Dept. of Mater. Sci. & Eng., North Carolina State Univ., Raleigh, NC, USA)

SO Thin Solid Films (1 Feb. 1995) vol.256, no.1-2, p.73-9. 16 refs.
Price: CCCC 0040-6090/95/\$9.50
CODEN: THSFAP ISSN: 0040-6090

DT Journal

TC Experimental

CY Switzerland

LA English

AB The electrical properties and crystallization of Pb(Zr_{0.53}Ti_{0.47})O₃ (**PZT**) thin films grown on RuO₂ electrodes by the sol-gel process have been studied. It was found that the amorphous as-deposited thin film first transforms to a pyrochlore phase at 500 degrees C. On further annealing, perovskite **PZT** begins to crystallize at about 600 degrees C. TEM analysis reveals that a pyrochlore-type second phase still exists in the films even after annealing to temperatures of 750 degrees C for 10 min. These **PZT** films are fatigue-free, but they show large property variation and high leakage currents ($J=10^{-3}$ A cm⁻² at 1 V). An 800 degrees C annealing treatment, for 10 min in air, of the RuO₂, **bottom** electrode prior to film deposition enhanced perovskite **PZT nucleation**, thereby eliminating the pyrochlore-type second phase. In addition, the leakage currents of **PZT** films grown on annealed RuO₂ electrodes are about two orders of magnitude lower than those of **PZT** films grown on unannealed RuO₂. It is also observed that annealing the entire capacitor stack after the **top** electrode deposition improved capacitor properties.

CC A7755 Dielectric thin films; A7780 Ferroelectricity and antiferroelectricity; A7360H Electronic properties of insulating thin films; A6170A Annealing processes; A6470K Solid-solid transitions

CT AMORPHOUS STATE; ANNEALING; **CRYSTALLISATION**; ELECTRICAL RESISTIVITY; **FERROELECTRIC MATERIALS**; **FERROELECTRIC THIN FILMS**; LEAD COMPOUNDS; LEAKAGE CURRENTS; TRANSMISSION ELECTRON MICROSCOPY

ST Pb(Zr_{0.53}Ti_{0.47})O₃ thin films; electrical properties; crystallization; sol-gel process; pyrochlore phase; annealing; TEM; fatigue-free; leakage currents; capacitor stack; phase evolution; 500 to 800 C; PbZr_{0.53}Ti_{0.47}O₃

CHI PbZr_{0.53}Ti_{0.47}O₃ ss, Ti_{0.47} ss, Zr_{0.53} ss, O₃ ss, Pb ss, Ti ss, Zr ss, O ss

PHP temperature 7.73E+02 to 1.07E+03 K

ET O*Pb*Ti*Zr; O sy 4; sy 4; Pb sy 4; Ti sy 4; Zr sy 4; Pb(Zr_{0.53}Ti_{0.47})O₃; Pb cp; cp; Zr cp; Ti cp; O cp; O*Ru; RuO₂; Ru cp; C; PbZr_{0.53}Ti_{0.47}O₃; PbZr_{0.53}Ti_{0.47}O; Ti; Zr; O; Pb

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